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OBSERVATIONS ON AMEBA FEEDING ON INFUSORIA, AND THEIR BEARING ON THE SURFACE-TENSION THEORY

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A considerable number of investigators hold that movement in Ameba is produced exclusively by changes in surface tension. Among the most prominent of these we may mention Bütschli (1892), Ryder (1894), Jensen (1905), and Verworn (1909). Many others, *e.g.*, Rhumbler (1910) and McClendon (1911), hold that while surface tension may not be the only factor involved in the process in question, it certainly is one of the most important. The results of our observations do not support these contentions.

Certain amebae at times feed almost exclusively on rotifers, at others they feed largely on paramecia. They capture the rotifers by flowing around the foot at the point of attachment to the substratum. After they have surrounded the foot they begin to flow out over the body. The rotifer responds by contracting and forcing the ameba back, after which it extends again and the ameba again begins to flow out over it, etc. In the meantime the foot begins to digest and gradually the rotifer weakens. Thus they continue sometimes for days before the rotifer is swallowed. The whole process is of such a nature that after observing it we were fully convinced that the force exerted by the amebae was far greater than could possibly be produced by changes in surface tension. The following observations prove this conviction to be correct with reference to the process of feeding on Paramecium.

When amebae are feeding on paramecia they assume a sort of mushroom shape with a serrate edge consisting of numerous short pseudopods. The paramecia tend to come to rest between and under these pseudopods by which they are usually surrounded, but sometimes the ends of the pseudopods approach each other before they are fully extended and cut the paramecium in two. This process requires approximately only ten seconds.

To cut a paramecium in two with a fine glass fiber it requires a pressure of approximately 9 mgm. Consequently, if the pseudopods have the same cutting quality as the glass fiber and if their movement is due to a change of surface tension, it would require, to perform the work involved, a reduction in surface tension of at least 1118 dynes per centimeter at the tips of the pseudopods. But if the pseudopods fuse along the edges near the ends so as to form a ring around the paramecium, and the cutting is due to constriction in this ring, and the constriction to a change in surface tension, the work involved would require a minimum reduction along the inner surface of the ring of at least 383 dynes per centimeter.

The bulk of evidence at hand seems to indicate that the paramecia are divided by the approach of two pseudopods and not by the constriction of a ring. To account for the process on the basis of the surface tension theory, therefore, the surface tension of the amebae would, in all probability, have to be considerably higher than 1118 dynes per centimeter. The surface tension of protoplasm is, however, only approximately 50 dynes per centimeter. It is, therefore, probably at best an insignificant factor in the process of feeding in Ameba.

More detailed descriptions of these observations and calculations will be published elsewhere.

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THE ELECTROMOTIVE FORCE PRODUCED BY THE ACCELERATION OF METALS

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Modern theories of electricity have led to the belief that the passage of an electric current through a metal really consists in the progressive motion of 'free' electrons contained in the body of the metal itself. If this be true we may now expect a number of effects arising from the *mass* of these electrons which were not predictable on the basis of older theories which thought of electricity as a sort of intangible massless fluid. As examples of such effects, we should expect the rear end of an *accelerated* rod of metal to become negatively charged owing to the lagging behind of the relatively mobile electrons which the metal contains,